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Filed : **December 12, 2001**

### **REMARKS**

Claims 1-32 were originally pending in the present application. Claims 27-32 were previously canceled in response to a restriction requirement. Claims 2 and 3 were canceled in response to the previous Office Action. Thus, Claims 1 and 4-26 were subject to examination as reported in the March 11, 2003 Office Action.

The proposed amendments to the claims and the following remarks are responsive to the March 11, 2003 Office Action. Claim 17 is canceled herein. Accordingly, Claims 1, 4-16 and 18-26 remain pending for further consideration by the Examiner.

#### **Amendment to Specification Addresses Noted Error**

Applicants have amended paragraph [0056] of the specification to correct an inadvertent error in which the substrate 72 is incorrectly referred to as the semiconductor chip (i.e., the FET 66). This was clearly an error because the base metal 140 discussed in the former paragraph [0055] is not the semiconductor chip but a portion of the substrate 72 and also because the next sentence beginning with "In other words" discusses the coefficient of linear expansion of the resin in comparison with those of the substrate 72 and the lands 144. One skilled in the art will readily determine from the context that the description refers to the substrate 72. No new matter is introduced by the amendment to the specification.

Applicants respectfully request the Examiner to enter the amendment.

#### **Response to Requirement for a New Oath or Declaration**

In section 3 of the Office Action, the Examiner states that the oath or declaration is defective and requires a new oath or declaration in compliance with 37 C.F. 1.67(a) that identifies the application by application number and filing date. In particular, the Examiner states that the oath or declaration is defective because non-initialed and/or non-dated alterations have been made in the oath or declaration (citing 37 C.F.R. § 1.52(c)).

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Applicants are submitting herewith a supplemental declaration that has no alterations. The supplemental declaration specifically refers to the prior amendments to the application and to the present amendments and is fully responsive to the Examiner's objection.

#### **Response to the Rejection of Claims 8-12 Under 35 U.S.C. § 112, Second Paragraph**

In Section 5 of the Office Action, the Examiner rejects Claims 8-12 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Examiner asserts that it is not clear what is meant by the expression "a coefficient of expansion of the synthetic resin being generally less than a coefficient of expansion of the substrate or a coefficient of expansion of the land and being generally greater than the other one of the coefficient of expansion of the substrate and the coefficient of efficient of expansion of the land" in Claim 8.

Applicants respectfully submit that the cited expression is clear as presented in previously amended Claim 8 and that the cited expression conforms with the following description in paragraph [0056] of the specification:

In other words, the coefficient of linear expansion of the resin is generally less than one of the coefficient of linear expansion of the substrate 72 and the coefficient of linear expansion of the lands 144, and the coefficient of linear expansion of the resin is generally greater than the other one of the coefficient of linear expansion of the substrate 72 and the coefficient of linear expansion of the lands 144.

Although Applicants submit that the cited expression in previously amended Claim 8 is clear in view of the specification, Applicants have amended Claim 8 herein to more explicitly express the value of the coefficient of expansion of the synthetic resin as being between the values of the coefficients of expansion of the substrate and the lands. In particular, the coefficient of expansion of the synthetic resin is defined as being generally smaller than the larger of the two other coefficients of expansion and as being generally larger than the smaller of the two other coefficients of expansion.

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In view of the amendment to Claim 8, Applicants respectfully request the Examiner to withdraw the rejections of Claims 8-12 under 35 U.S.C. § 112, second paragraph.

In further view of the Examiner's statement that Claims 8-12 would be allowable if rewritten or amended to overcome the rejection under 35 U.S.C. § 112, second paragraph, Applicants respectfully submit that Claims 8-12 are now in condition for allowance, and Applicants respectfully request allowance of Claims 8-12.

#### **Response to the Rejection of Claims 16-19, 21, 23 and 24 Under 35 U.S.C. § 102(b)**

In Section 7 of the Office Action, the Examiner rejects Claims 16-19, 21, 23 and 24 under 35 U.S.C. § 102(b) as anticipated by Japanese Patent No. 63-213936 to Yanagisawa.

Applicants have cancelled Claim 17 without prejudice and have amended Claims 16, 18 and 19 herein. Applicants respectfully traverse the rejection of Claims 16, 18, 19, 21, 23 and 24 for the following reasons.

#### **Claim 16, 18, 19, 21, 23 and 24**

Amended Claim 16 recites a semiconductor device comprising a substrate. A land is formed on the substrate. A semiconductor chip is mounted on the land. A solder layer joins the semiconductor chip with the land. The semiconductor chip defines at least two corners positioned generally opposite to each other. The land has an outer boundary defining at least two corner portions disposed in proximity to the corners of the semiconductor chip. The outer boundary further defines contiguous portions extending next to the corner portions and spaced apart from the semiconductor chip more than the corner portions. The corner portions of the land generally confine the corners of the semiconductor chip therein.

Yanagisawa does not disclose an outer boundary that further defines contiguous portions extending next to the corner portions and spaced apart from the semiconductor chip more than the corner portions. Thus, amended Claim 16 is not anticipated by Yanagisawa. Claims 18, 19, 21, 23 and 24 depend from Claim 16 and are not anticipated by Yanagisawa for at least the same

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reasons as Claim 16. Applicants respectfully request the Examiner to withdraw the rejection of Claims 16, 18, 19, 21, 23 and 24 under 35 U.S.C. § 102(b).

Please note that the amendment to Claim 18 conforms Claim 18 to the following description in paragraph [0067] of the specification:

Any configuration of the semiconductor chip 66 can be used with the positioning corners 150 of the land 144 inasmuch as the configuration has at least one diagonal line. That is, the configurations can include, for example, any rectangular and square shapes.

#### **Response to the Rejection of Claims 1, 4 and 13 Under 35 U.S.C. § 103(a)**

In Section 9 of the Office Action, the Examiner rejects Claims 1, 4 and 13 under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 5,373,190 to Ichiyama in view of Japanese Patent No. 63-213936 to Yanagisawa.

Applicants have amended Claim 13 herein. Claims 1 and 4 remain as previously amended.

Applicants respectfully traverse the rejection of Claims 1 and 4 and amended Claim 13 for the following reasons.

#### **Claim 1**

Claim 1 recites a semiconductor device comprising a substrate and a land formed on the substrate. A semiconductor chip is mounted on the land. The semiconductor chip is joined with the land only through a solder layer. A synthetic resin covers the land, the solder layer and the semiconductor chip on the substrate. A coefficient of expansion of the synthetic resin is generally less than a coefficient of expansion of the substrate or a coefficient of expansion of the land.

The combination of Ichiyama and Yanagisawa does not teach or suggest all the limitations of Claim 1. Yanagisawa discloses an alumina ceramic substrate 1. The alumina ceramic substrate is a kind of ceramic substrate and its coefficient of expansion is generally between 3.6-7.7 ppm/ $^{\circ}$ K. Yanagisawa also discloses silicon resin 8. A coefficient of expansion

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of the silicon resin is generally between 190-1,000 ppm/ $^{\circ}$ K. The coefficient of expansion of silicon resin is clearly greater than the coefficient of expansion of the alumina ceramic substrate. Thus, the combination of Ichiyama and Yanagisawa, even if those references could be combined together, does not teach or suggest a coefficient of expansion of the synthetic resin that is generally less than a coefficient of expansion of the substrate or a coefficient of expansion of the land. Applicants respectfully submit that Claim 1 is not rendered obvious by the combination of Ichiyama and Yanagisawa, and Applicants respectfully request the Examiner to withdraw the rejection of Claim 1 under 35 U.S.C. § 103(a).

#### **Claim 4**

Claim 4 recites a semiconductor device comprising a substrate. The substrate comprises aluminum. A land is formed on the substrate. A semiconductor chip is mounted on the land. The semiconductor chip is joined with the land only through a solder layer. A synthetic resin covers the land, the solder layer and the semiconductor chip on the substrate. A coefficient of expansion of the synthetic resin is generally less than a coefficient of expansion of aluminum.

The combination of Ichiyama and Yanagisawa does not teach or suggest all the limitations of Claim 4. As discussed above, Yanagisawa discloses the alumina ceramic substrate. The alumina ceramic substrate of Yanagisawa does not correspond to the aluminum substrate defined in Claim 4. For example, a coefficient of expansion of the alumina ceramic substrate is generally between 3.6-7.7 ppm/ $^{\circ}$ K, which is substantially less than 23 ppm/ $^{\circ}$ K, which is the approximate coefficient of the aluminum substrate. Further, Yanagisawa discloses the silicon resin. The coefficient of expansion of the silicon resin is generally 190-1,000 ppm/ $^{\circ}$ K. The coefficient of expansion of silicon resin is clearly greater than the coefficient of expansion of the alumina ceramic substrate. Thus, the combination of Ichiyama and Yanagisawa does not teach or suggest a coefficient of expansion of the synthetic resin that is generally less than a coefficient of expansion of aluminum. Applicants respectfully submit that Claim 4 is not rendered obvious by the combination of Ichiyama and Yanagisawa, and Applicants respectfully request the Examiner to withdraw the rejection of Claim 4 under 35 U.S.C. § 103(a).

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### **Claim 13**

Claim 13 depends from Claim 1 and further defines the invention defined in Claim 1 with respect to the structure of the land. Claim 13 is patentably distinguished over the cited references for at least the reasons set forth above with respect to amended Claim 1. Claim 13 is further patentably distinguished over the cited references because Claim 13 defines the structure of the land in combination with the structure of amended Claim 1. Applicants respectfully submit that Claim 13 is allowable, and Applicants respectfully request the Examiner to withdraw the rejection of Claim 13 under 35 U.S.C. § 103(a).

### **Response to the Rejection of Claim 6 Under 35 U.S.C. § 103(a)**

In Section 10 of the Office Action, the Examiner rejects Claim 6 under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 5,373,190 to Ichiyama in view of Japanese Patent No. 63-213936 to Yanagisawa and U.S. Patent No. 5,844,305 to Shin et al. Applicants respectfully traverse the rejection of Claim 6 for the following reasons.

### **Claim 6**

Claim 6 depends from Claim 4 and further defines the land comprising copper. Claim 6 is patentably distinguished over the cited references for at least the reasons set forth above with respect to amended Claim 4. Claim 6 is further patentably distinguished over the cited references because Claim 6 defines a further structural limitation on the material of the land. Applicants respectfully submit that Claim 6 is allowable, and Applicants respectfully request the Examiner to withdraw the rejection of Claim 6 under 35 U.S.C. § 103(a).

### **Response to the Rejection of Claims 5 and 7 Under 35 U.S.C. § 103(a)**

In Section 11 of the Office Action, the Examiner rejects Claims 5 and 7 under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 5,373,190 to Ichiyama in view of Japanese Patent No. 63-213936 to Yanagisawa and Japanese Publication No. 53-143656 to Nippon. Claim 5 is

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amended herein to conform with the antecedent basis for the coefficient of expansion in Claim 4. Applicants respectfully traverse the rejection of Claims 5 and 7 for the following reasons.

### **Claim 5**

Claim 5 depends from Claim 4 and further defines the synthetic resin as having a coefficient of expansion that is generally less than approximately 23 ppm/ $^{\circ}$ K. Claim 5 is patentably distinguished over the cited references for at least the reasons set forth above with respect to Claim 4. Claim 5 is further patentably distinguished over the cited references because Claim 5 defines a further structural limitation on the value of the coefficient of expansion of the synthetic resin. Applicants respectfully submit that Claim 5 is allowable, and Applicants respectfully request the Examiner to withdraw the rejection of Claim 5 under 35 U.S.C. § 103(a).

### **Claim 7**

Claim 7 depends from Claim 4 and further defines the synthetic resin including epoxide. Claim 7 is patentably distinguished over the cited references for at least the reasons set forth above with respect to Claim 4. Claim 7 is further patentably distinguished over the cited references because Claim 7 defines a further structural limitation of the synthetic resin of Claim 4. Applicants respectfully submit that Claim 7 is allowable, and Applicants respectfully request the Examiner to withdraw the rejection of Claim 7 under 35 U.S.C. § 103(a).

### **Response to the Rejection of Claims 14 and 15 Under 35 U.S.C. § 103(a)**

In Section 12 of the Office Action, the Examiner rejects Claims 14 and 15 under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 5,373,190 to Ichiyama in view of Japanese Patent No. 63-213936 to Yanagisawa and Japanese Patent No. 2000-253570 to Yamanashi. Applicants respectfully traverse the rejection of Claims 14 and 15 for the following reasons.

### **Claims 14 and 15**

Claims 14 and 15 depend from Claim 1 and further define the invention defined in Claim 1. Claims 14 and 15 are patentably distinguished over the cited references for at least the

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reasons set forth above with respect to Claim 1. Claims 14 and 15 are further distinguished over the cited references because each claim defines an additional feature in combination with the limitations of amended Claim 1. Applicants respectfully submit that Claims 14 and 15 are allowable, and Applicants respectfully request the Examiner to withdraw the rejection of Claims 14 and 15 under 35 U.S.C. § 103(a).

**Response to the Rejection of Claims 20, 22 and 26 Under 35 U.S.C. § 103(a)**

In Section 13 of the Office Action, the Examiner rejects Claims 20, 22 and 26 under 35 U.S.C. § 103(a) as obvious over Japanese Patent No. 63-213936 to Yanagisawa. Claims 20 and 22 have been amended herein. Applicants respectfully traverse the rejection of amended Claims 20 and 22 and traverse the rejection of Claim 26 for the following reasons.

**Claims 20, 22 and 26**

Claims 20, 22 and 26 depend from Claim 16 and further define structural features of the invention defined in Claim 16. Claims 20, 22 and 26 are patentably distinguished over Yanagisawa for at least the reasons set forth above with respect to Claim 16. Claims 20, 22 and 26 are further distinguished over Yanagisawa because each claim defines an additional feature in combination with the limitations of Claim 16. Applicants respectfully submit that Claims 20, 22 and 26 are allowable, and Applicants respectfully request the Examiner to withdraw the rejection of Claims 20, 22 and 26 under 35 U.S.C. § 103(a).

**Response to the Rejection of Claim 25 Under 35 U.S.C. § 103(a)**

In Section 14 of the Office Action, the Examiner rejects Claim 25 under 35 U.S.C. § 103(a) as obvious over Japanese Patent No. 63-213936 to Yanagisawa in view of Japanese Patent No. 2000-253570 to Yamanashi. Applicants respectfully traverse the rejection of Claim 25.

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### **Claim 25**

Claim 25 depends from Claim 16 and further defines the invention defined in Claim 16. Claim 25 is patentably distinguished over the cited references for at least the reasons set forth above with respect to Claim 16. Claim 25 is further distinguished over the cited references because Claim 25 defines additional features in combination with the limitations of Claim 16. Applicants respectfully submit that Claim 25 is allowable, and Applicants respectfully request the Examiner to withdraw the rejection of Claim 25 under 35 U.S.C. § 103(a).

### **Summary**

Applicants respectfully request the Examiner to withdraw the rejections of Claims 1, 4-16 and 18-26 under 35 U.S.C. § 112, second paragraph, 35 U.S.C. § 102(b), and under 35 U.S.C. § 103(a). Applicants respectfully submit that Claims 1, 4-16 and 18-26 are now in condition for allowance, and Applicants respectfully request allowance of Claims 1, 4-16 and 18-26.

### **Request for Telephone Interview**

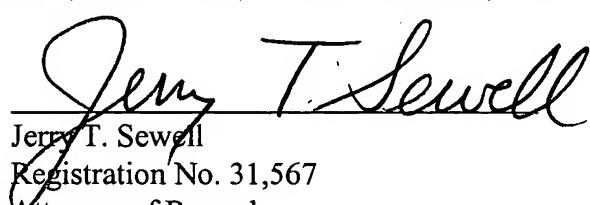
If there are any impediments to the prompt allowance of this application or if there are any questions or issues that may be resolved via a telephone interview, Applicants invite the Examiner to call the undersigned attorney of record at 949-721-2849 (direct) or at the general office telephone number listed below.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

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